02-8803-65-SI
REV. NO. 0

DRAFT SITE INSPECTION REPORT
PONCE WASTE DISPOSAL
MAGUEYES WARD, PONCE, PUERTO RICO

PREPARED UNDER
TECHNICAL DIRECTIVE DOCUMENT NO. 02-8803-65
CONTRACT NO. 68-01-7346

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

AUGUST 2, 1988

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY:

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SITE NAME:	Ponce Waste Disposal	**EPA ID NO.:**	PRD980640957
ADDRESS:	Ponce Municipal Dump Magueyes Ward Ponce, Puerto Rico	**LATITUDE:** **LONGITUDE:**	18° 02' 03" N 66° 37' 38" W

1.0 SITE SUMMARY

The Ponce Waste Disposal Site is located in the south-central portion of Puerto Rico approximately 1 mile west of the Ponce city limits. Because it is so close to the city, the population within 3 miles of the site is quite large totaling approximately 106,600. Its immediate surroundings consist of lightly forested land, with the exception of the eastern boundary, which is adjacent to a large quarry or stone pit. The closest community, Jardines del Caribe, is located approximately 750 feet northeast of the site. The entire property covers 120 acres, of which roughly 33 acres have been used for disposal. Background information indicates that hazardous waste was randomly placed in several areas throughout the facility.

Ponce Waste Disposal originated in the early 1970s as an open waste burning site owned and operated by the Municipality of Ponce. In 1974, it was converted to a sanitary landfill, and a year later, the Municipality began seeking RCRA permits to expand operations. In 1980 the Puerto Rico Environmental Quality Board (EQB) authorized the landfill to accept heavy metal sludge from SK and F Laboratories, and on November 19 of that year, the Municipality submitted a Part A permit application seeking RCRA interim status for the operation of a hazardous waste facility. The permit was to cover two surface impoundments where the sludge was disposed of, as well as the landfill portion of the site. On June 16, 1981, the facility was granted interim status by the EQB.

In 1982, the Environmental Protection Agency (EPA) conducted an inspection at the facility. They found no records available for industrial waste receipt except for those wastes disposed of by SK and F. As a result, the EPA determined that the lagoons qualified for RCRA interim status, but the landfill did not. In addition, the EPA notified Ponce officials that the management of the surface impoundments violated the following interim status requirements:

- Closure had been initiated on two surface impoundments without an EPA-approved closure plan and postclosure plan.
- One surface impoundment was at capacity, and its liner had been destroyed.
- A groundwater monitoring system had not been installed.
- Security at the site was inadequate.

The negligent handling of the surface impoundments may have resulted in contaminant migration and, subsequently, the contamination of both the soil and groundwater. The EPA issued a $30,000 fine which was later reduced to $5,000 because of the financial condition of the municipality.

In 1983, the Mayor of Ponce contracted CECOS International, Inc. (CECOS) to manage the site, who in turn assured the EPA that they would conduct a geohydrologic study of the site, install groundwater monitoring wells, and remediate uncontrolled hazardous wastes. On May 16, 1983, the municipality and CECOS submitted a joint agreement plan to EPA addressing the interim status violations. The plan was approved and on August 23, 1983, the EPA reauthorized interim status for the landfill. On this same day, CECOS submitted a Part B application to EPA, seeking a permit to construct a new hazardous waste management system on site. The following December, residents living near the site filed a lawsuit against CECOS to prevent construction of the new hazardous waste system and to stop the dumping of hazardous waste already taking place. At the same time, the Mayor of Ponce filed a suit against CECOS for failing to comply with all local and federal laws pertaining to the site.

On September 5, 1984, the EQB inspected the facility, cited it for several violations, and ordered the site to cease and desist operations. CECOS was denied permission to construct the new hazardous waste disposal system, but they were granted a temporary permit for handling nonindustrial, nonhazardous wastes.

On April 25, 1988, NUS FIT 2 conducted a site inspection at the facility, during which four soil samples were collected from the former lagoon area. Currently, Ponce officials are still involved in legal proceedings against CECOS, and the proposed hazardous waste management system has not yet been built. The site is operating as a municipal sanitary landfill and is leased by Browning-Ferris Industries (BFI), CECOS' parent company.

During the NUS FIT 2 site inspection, a constant flow of vehicles travelled into and out of the facility, most of which were carrying fill material to cover the active landfill. Conditions were very dry and dusty, and throughout the day a truck cruised around the site hosing down the dirt access roads. The active landfill appeared to be well covered, and there were no signs of litter on the ground surface. However, the former lagoon area was covered with debris, including bottles, cans, plastic and paper waste, as well as a large hypodermic needle. A smaller section of land southwest of this area has been designated for asbestos disposal. It was roped off, well covered, and posted with several signs stating that it was an asbestos disposal area and that if accessed, respirators should be worn.

Ref. Nos. 1, 2, 5, 6, 9, 10, 11, 12, 14

2.0 SITE INSPECTION NARRATIVE

2.1 WASTE SOURCE DESCRIPTION

Not all of the locations on site where hazardous waste disposal took place have been identified. Background information indicates that between 1974 and 1980, several state agencies and industries disposed of hazardous waste at the facility. This disposal took place throughout the site in a random fashion, and there are no records documenting the receipt of industrial waste. However, the presence of four hazardous waste sources (three surface impoundments and the sanitary landfill) has been documented.

In January 1980, SK and F Laboratories requested permission to dispose of its waste sludge at the Ponce facility. A month later, the request was approved by the EQB, and SK and F constructed two surface impoundments on the property. The sludge reportedly contained heavy metals, such as barium, chromium, copper, nickel, silver, and zinc, as well as halogenated organics, soluble organic carbon, sulfides, and cyanide. The amount of sludge varied from week to week, but an estimated 870,000 gallons was disposed of on site over a 19-month period. Treatment of the sludge consisted of mixing and volume reduction by evaporation.

On February 25, 1982, the EPA conducted an inspection at the site and found only one surface impoundment to be in use. It was filled to capacity, the liner was severely cracked or cut in several places, and the material inside emitted a strong, tarlike odor. Directly adjacent to this were two empty impoundments, both displaying obvious signs of use. One was cement-lined, but the liner was corroded and full of holes and cracks. It is reported that the waste sludge in the lagoon had dissolved the cement liner, causing a spill that covered a large area downgradient. The impoundment in use had been built as a replacement. The third impoundment had no liner but bore traces of the same waste sludge.

Closure of the lagoons involved the solidification of the waste sludge material and the excavation of the solidified waste, the impoundment liner, and the underlying sand layer. However, the available information gives no indication as to the amount of material removed during these proceedings. The containment berm was graded into each impoundment, and 1 foot of cover material was applied. The excavated materials were transported to and disposed of at Browning Ferris Industries' Calcasieu facility in Louisiana. Closure is documented as having occurred on September 24, 1983, although it was implemented without EPA approval.

The sanitary landfill portion of the site began operating in 1974 and received interim status as a hazardous waste facility in 1980. During the intervening years, it functioned mainly as a municipal landfill but reportedly received hazardous waste from several state agencies and industries. Some of these incidents of disposal, as described below, were authorized by the EQB.

- On February 11 and 12, 1978, 500 5-gallon drums of caustic soda were buried at a depth of 15 feet.
- National Packing disposed of 37,500 gallons of sludge per week. The composition of the sludge and the disposal dates are unknown.
- The Puerto Rico Aqueduct and Sewer Authority (PRASA) disposed of unknown quantities of sludge from the Ponce Sewage Treatment Plant. The disposal was authorized by the EQB.
- A total of 9,000 cubic yards per year of hydrocarbon sludge from the CORCO facility was disposed of on site, although the number of years is not specified.
- Ten drums of spent wastes with traces of PCBs were disposed of by National Packing in February 1978. The waste was the result of the company's warehouse cleanup and was authorized by EQB.
- A total of 20,800 cubic yards of spent caustics was disposed of on site by R.R. Olefins, Penuelas. The date(s) of disposal are not specified.
- A total of 2,800 cubic yards of carbon and hydrocarbon wastes was disposed of on site by Oxochem, Penuelas. The date(s) of disposal are not specified.
- The EQB authorized the disposal of petroleum waste at the Ponce facility. The waste was the result of a beach cleanup that took place after R.R. Olefins spilled petroleum in Tallaboa Bay.
- Asbestos waste material, resulting from the dismantling of houses, was observed being mixed and buried with municipal waste, or left out in piles. That which was left in piles accumulated a fine powdery material on and around it. There were no signs or labels to indicate to workers the nature of the waste.
- Sludge was observed spilling out of a truck onto the access road, en route to the landfill. Background information did not specify the origin of the sludge.
- In a letter from the Associate Director of Noise and Solid Waste Control to the Auxiliary Secretary of Social Services, it was stated that four sanitary landfills would be accepting pesticides derived from DDT. The Ponce landfill was included, but it is unknown if such disposal actually took place.

The landfill covered approximately 33 acres, although the area actually utilized for disposal changed continually. It was operated in three stages, ranging from two to three tiers, and reportedly stopped receiving hazardous waste in September 1984.

Ref. Nos. 1, 2, 3, 4, 5, 6

2.2 EXISTING ANALYTICAL DATA

In 1983, CECOS contracted the Law Engineering Testing Company of Marietta, Georgia to conduct a site characterization study at the Ponce facility. Field work consisted of exploratory and soil test borings, seismic refraction, resistivity and electromagnetic conductivity surveys, borehole geophysical logging, geologic mapping, groundwater level monitoring, and downhole permeability testing. The work was conducted from February 14 to April 5, 1983, and was supplemented by background file reviews, air photo interpretation, and interviews with area professionals.

Initially, five monitoring wells were drilled, but due to the complex groundwater system underlying the site, three additional wells were constructed. The eight monitoring wells are located in a radial pattern around the proposed hazardous waste system as is indicated in the site map (Figure2) provided in section 3. There are no monitoring wells around that portion of the landfill currently in use, which is the same area that received hazardous waste in the past. One of the existing wells, monitoring well No. 6 (MW-6), appears as if it is downgradient of the landfill. During the NUS FIT 2 site inspection an attempt was made to locate an upgradient PRASA well to be sampled in conjunction with MW-6. Inquiries made by the EQB revealed that the wells on site and the PRASA wells in the area are drawing from separate aquifers and could not provide a representative groundwater sample. Consequently, no groundwater samples were collected during the site inspection.

The existing monitoring wells were sampled by Law Engineering for CECOS several times between August 1983 and March 1984, and analyzed for priority pollutants. Heavy metals, including chromium, nickel, barium, copper, lead, and zinc, were detected in some of the wells, as well as benzenehexachloride (BHC), dichloroethylene, dieldrin, and endosulfan. The results of the well sampling are summarized in Table I. During this same period, CECOS collected approximately 100 soil borings on site. Soil samples were collected from around the surface impoundment area, the active landfill, and the dirt access road, and analyzed for hazardous constituents. Data generated from these analyses show that the impoundment area contained low levels of cyanide, lead, zinc, and halogenated organics. Those from the landfill were found to contain cyanide, barium, and trace amounts of PCBs. The soils from the access road contained no hazardous constituents. The data from the landfill and surface impoundment area are summarized in Tables 2 and 3, respectively.

During the NUS FIT 2 site inspection, it was difficult to pinpoint sample locations that would accurately reflect the facility's past disposal practices. This was due to a combination of circumstances including the vast size of the site, the conflicting accounts of where hazardous waste was actually disposed of, and the limited time available. Since the former lagoon area is the only

TABLE I*

SUMMARY OF GROUNDWATER MONITORING WELL DATA

PARAMETER	UNITS	MW-2 Sampling Dates					MW-3 Sampling Dates					MW-4 Sampling Dates					MW-5 Sampling Dates				
		8/83	11/83	1/84	2/84	3/84	8/83	11/83	1/84	2/84	3/84	8/83	11/83	1/84	2/84	3/84	8/83	11/83	1/84	2/84	3/84
Bromodichloromethane	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	NR	ND
Chloroform	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NR	ND	ND	NR	ND
Aldrin	ug/L	NR	0.03	<0.01	<0.01	<0.01	NR	<0.01	<0.01	<0.01	<0.01	NR	0.01	<0.01	<0.01	<0.01	NR	0.05	<0.1	NR	<0.01
BHC	ug/L	NR	0.44	0.11	<0.01	<0.01	NR	0.03	0.16	<0.01	<0.01	NR	<0.01	0.17	<0.01	<0.01	NR	0.37	31.0	NR	<0.01
Dieldrin	ug/L	NR	0.01	<0.01	<0.01	<0.01	NR	<0.01	<0.01	<0.01	<0.01	NR	<0.01	0.07	<0.01	<0.01	NR	0.59	<0.1	NR	<0.01
Endosulfan	ug/L	NR	0.08	<0.01	<0.01	<0.01	NR	<0.01	0.06	<0.01	<0.01	NR	0.99	0.03	<0.01	<0.01	NR	0.11	<0.1	NR	<0.01
Heptachlor	ug/L	NR	0.01	<0.01	<0.01	<0.01	NR	0.02	<0.01	<0.01	<0.01	NR	2.5	<0.01	<0.01	< 0.01	NR	<0.02	<0.1	NR	<0.01
Epoxide	ug/L	NR	<0.01	<0.01	<0.01	NR	NR	<0.01	<0.01	<0.01	NR	NR	0.09	<0.01	<0.01	NR	NR	<0.02	<0.1	NR	<0.01
trans-1,2-dichloromethylene	ug/L	NR	ND	ND	ND	ND	NR	ND	ND	ND	ND	NR	ND	ND	ND	ND	NR	22.0	22.0	NR	<0.01
t-Soluble Aluminum	mg/L	NR	0.35	<0.2	7.2	0.41	NR	0.25	<0.2	2.3	0.33	NR	<0.06	<0.2	2.4	0.59	NR	0.22	<0.2	NR	0.45
t-Soluble Barium	mg/L	NR	0.037	1.29	0.70	0.17	NR	0.35	0.55	1.90	0.14	NR	0.36	0.59	2.4	<0.03	NR	0.59	1.46	NR	0.50
t-Soluble Calcium	mg/L	NR	391.0	452.0	305.0	200.0	NR	571.0	798.0	750.0	1,889.0	NR	556.0	971.0	821.0	1,380.0	NR	819.0	1,040.0	NR	1,430.0
t-Soluble Iron	mg/L	NR	0.55	0.27	19.2	<0.004	NR	1.80	0.40	3.30	0.74	NR	0.12	<0.03	6.20	2.10	NR	1.20	<0.03	NR	1.10
t-Soluble Lead	mg/L	NR	<0.002	<0.002	0.006	0.02	NR	<0.002	<0.002	<0.002	0.01	NR	<0.002	<0.002	0.011	0.02	NR	<0.002	<0.002	NR	0.11
t-Soluble Magnesium	mg/L	NR	560.0	235	193.0	190.0	NR	855.0	740.0	935.0	1,200.0	NR	735.0	530.0	880.0	850.0	NR	840.0	530.0	NR	650.0
t-Soluble Manganese	mg/L	NR	0.02	<0.01	0.49	0.04	NR	0.23	0.23	0.26	0.14	NR	0.04	0.17	0.24	0.51	NR	2.30	2.60	NR	6.10
t-Soluble Molybdenum	mg/L	NR	0.23	<0.08	<0.08	<0.2	NR	<0.08	<0.08	<0.08	<0.2	NR	0.08	<0.08	<0.08	<0.20	NR	<0.08	<0.08	NR	<0.2
t-Soluble Potassium	mg/L	NR	13.0	14.0	13.5	11.0	NR	50.0	61.0	75.0	68	NR	30.0	62.0	73.0	73.0	NR	141.0	136.0	NR	190.0
t-Soluble Sodium	mg/L	NR	1,150.0	1,030.0	1,300.0	770	NR	1,740.0	1,510.0	1,920.0	1,400.0	NR	980.0	1,050.0	1,330.0	1,000.0	NR	4,650.0	3 ,500.0	NR	4,600.0
t-Soluble Vanadium	mg/L	NR	2.8	2.20	<0.10	<0.12	NR	4.1	3.6	<0.10	<0.12	NR	3.7	4.10	<0.1	<0.12	NR	5.80	5.60	NR	<0.12
t-Soluble Arsenic	mg/L	NR	0.046	0.010	<0.005	<0.005	NR	0.024	<0.005	0.006	<0.005	NR	<0.005	<0.005	<0.008	<0.005	NR	<0.005	<0.005	NR	<0.005
t-Soluble Cadmium	mg/L	NR	0.018	<0.007	<0.02	<0.007	NR	0.029	0.014	<0.02	<0.007	NR	0.020	<0.002	<0.02	<0.007	NR	0.039	<0.007	NR	<0.007
t-Soluble Chromium	mg/L	NR	<0.006	<0.004	0.027	<0.008	NR	0.008	<0.004	0.078	<0.008	NR	0.008	0.014	0.021	<0.008	NR	0.014	0.004	NR	<0.008
t-Soluble Selenium	mg/L	NR	0.248	0.356	0.186	0.05	NR	0.069	0.098	0.034	0.008	NR	0.053	0.066	0.042	0.02	NR	<0.005	<0.005	NR	<0.005
t-Soluble Silver	mg/L	NR	0.009	<0.005	0.207	<0.009	NR	<0.008	0.008	0.040	<0.009	NR	<0.008	0.007	0.047	<0.009	NR	<0.008	0.023	NR	<0.009
t-Soluble Antimony	mg/L	NR	0.033	<0.01	<0.01	0.005	NR	0.028	<0.01	0.023	0.009	NR	0.013	<0.010	0.044	0.006	NR	0.033	<0.01	NR	0.007
t-Soluble Beryllium	mg/L	NR	<0.007	<0.006	<0.004	<0.006	NR	<0.007	<0.006	<0.004	<0.006	NR	<0.007	<0.006	<0.004	<0.006	NR	0.008	<0.006	NR	<0.006
t-Soluble Copper	mg/L	NR	<0.01	0.044	0.106	0.02	NR	<0.01	0.068	0.037	<0.009	NR	<0.01	0.110	0.054	0.02	NR	0.056	0.064	NR	0.03
t-Soluble Nickel	mg/L	NR	0.035	0.037	0.010	0.01	NR	0.042	0.041	0.032	0.04	NR	0.009	0.024	0.015	0.03	NR	0.089	0.139	NR	0.30
t-Soluble Thallium	mg/L	NR	0.012	<0.01	<0.01	<0.005	NR	0.021	<0.01	0.013	<0.005	NR	0.019	<0.01	0.014	<0.005	NR	0.028	<0.01	NR	0.006
t-Soluble Zinc	mg/L	NR	0.027	0.254	0.193	0.14	NR	0.182	0.678	0.129	0.11	NR	0.027	0.626	0.131	0.22	NR	0.238	0.394	NR	0.11

TABLE I* (Cont'd)

SUMMARY OF GROUNDWATER MONITORING WELL DATA

PARAMETER	UNITS	MW-6 Sampling Dates					MW-7 Sampling Dates					MW-8 Sampling Dates				
		8/83	11/83	1/84	2/84	3/84	8/83	11/83	1/84	2/84	3/84	8/83	11/83	1/84	2/84	3/84
Bromodichloromethane	ug/L	NR	NR	NR	ND	NR	NR	NR	ND	ND	ND	NR	NR	NR	NR	ND
Chloroform	ug/L	NR	NR	NR	ND	NR	NR	NR	ND	ND	ND	NR	NR	NR	NR	ND
Aldrin	ug/L	NR	NR	NR	<0.01	NR	NR	NR	<0.01	<0.01	<0.01	NR	NR	NR	NR	<0.01
BHC	ug/L	NR	NR	NR	<0.01	NR	NR	NR	2.30	<0.01	<0.01	NR	NR	NR	NR	<0.01
Dieldrin	ug/L	NR	NR	NR	<0.01	NR	NR	NR	<0.01	<0.01	<0.01	NR	NR	NR	NR	<0.01
Endosulfan	ug/L	NR	NR	NR	<0.01	NR	NR	NR	0.05	<0.01	<0.01	NR	NR	NR	NR	<0.01
Heptachlor	ug/L	NR	NR	NR	<0.01	NR	NR	NR	0.01	<0.01	<0.01	NR	NR	NR	NR	<0.01
Epoxide	ug/L	NR	NR	NR	<0.01	NR	NR	NR	0.01	<0.01	<0.01	NR	NR	NR	NR	<0.01
trans-1,2-dichloromethylene	ug/L	NR	NR	NR	ND	NR	NR	NR	ND	ND	ND	NR	NR	NR	NR	<0.01
t-Soluble Aluminum	mg/L	NR	NR	NR	9.70	NR	NR	NR	<0.2	0.70	0.43	NR	NR	NR	NR	0.35
t-Soluble Barium	mg/L	NR	NR	NR	1.45	NR	NR	NR	0.39	0.54	0.24	NR	NR	NR	NR	0.11
t-Soluble Calcium	mg/L	NR	NR	NR	411.0	NR	NR	NR	67.3	272.0	885.0	NR	NR	NR	NR	450.0
t-Soluble Iron	mg/L	NR	NR	NR	28.0	NR	NR	NR	<0.03	9.3	4.70	NR	NR	NR	NR	<0.04
t-Soluble Lead	mg/L	NR	NR	NR	0.006	NR	NR	NR	<0.002	<0.002	0.03	NR	NR	NR	NR	0.04
t-Soluble Magnesium	mg/L	NR	NR	NR	228.0	NR	NR	NR	170.0	1 63.0	300.0	NR	NR	NR	NR	26.0
t-Soluble Manganese	mg/L	NR	NR	NR	0.73	NR	NR	NR	0.01	1.12	1.60	NR	NR	NR	NR	0.02
t-Soluble Molybdenum	mg/L	NR	NR	NR	<0.08	NR	NR	NR	<0.08	<0.08	<0.20	NR	NR	NR	NR	<0.20
t-Soluble Potassium	mg/L	NR	NR	NR	24.4	NR	NR	NR	40.0	58.0	57.0	NR	NR	NR	NR	21.0
t-Soluble Sodium	mg/L	NR	NR	NR	980.0	NR	NR	NR	640.0	1,170.0	87.0	NR	NR	NR	NR	94.0
t-Soluble Vanadium	mg/L	NR	NR	NR	<0.10	NR	NR	NR	0.54	<0.1	<0.12	NR	NR	NR	NR	<0.12
t-Soluble Arsenic	mg/L	NR	NR	NR	0.011	NR	NR	NR	<0.005	<0.005	<0.005	NR	NR	NR	NR	<0.005
t-Soluble Cadmium	mg/L	NR	NR	NR	<0.02	NR	NR	NR	<0.007	<0.02	<0.007	NR	NR	NR	NR	<0.007
t-Soluble Chromium	mg/L	NR	NR	NR	0.042	NR	NR	NR	<0.004	0.011	<0.008	NR	NR	NR	NR	0.02
t-Soluble Selenium	mgL	NR	NR	NR	0.006	NR	NR	NR	0.005	<0.005	<0.005	NR	NR	NR	NR	< 0.005
t-Soluble Silver	mg/L	NR	NR	NR	0.032	NR	NR	NR	0.005	<0.01	<0.009	NR	NR	NR	NR	<0.009
t-Soluble Antimony	mg/L	NR	NR	NR	<0.01	NR	NR	NR	<0.01	<0.010	< 0.005	NR	NR	NR	NR	0.005
t-Soluble Beryllium	mg/L	NR	NR	NR	<0.004	NR	NR	NR	<0.006	<0.004	<0.006	NR	NR	NR	NR	<0.006
t-Soluble Copper	mg/L	NR	NR	NR	0.114	NR	NR	NR	0.006	0.015	0.02	NR	NR	NR	NR	0.01
t-Soluble Nickel	mg/L	NR	NR	NR	0.057	NR	NR	NR	<0.005	0.009	0.006	NR	NR	NR	NR	<0.005
t-Soluble Thallium	mg/L	NR	NR	NR	<0.01	NR	NR	NR	<0.01	<0.01	<0.005	NR	NR	NR	NR	<0.02
t-Soluble Zinc	mg/L	NR	NR	NR	0.786	NR	NR	NR	0.2	1.75	0.03	NR	NR	NR	NR	0.02

*The data presented in Table I were taken from the Final RCRA Facility Assessment Report, Municipal Dump Facility, Ponce, Puerto Rico. The report was prepared for the U.S. EPA Region 2 by A.T. Kearny, Inc. and Lee Wan and Associates, Inc. in October, 1987. MW-1 is not represented in Table I, although it did contain 3.5 ug/L bromodichloromethane and 17 ug/L chloroform. Both of these contaminants were detected following the August 1983 sampling run, but none of the other parameters represented in Table I were detected at that time. Additionally, MW-1 was not sampled during the four subsequent sampling runs. The RCRA report did not provide an explanation for this, but it was learned during the NUS FIT 2 site inspection that MW-1 is inoperable. Sampling data for the remaining monitoring wells that were not provided by the RCRA report are represented by NR in Table I, while those contaminants not detected are represented by ND.

Source: Final RCRA Facility Assessment Report, Municipal Dump Facility, Ponce, Puerto Rico, October 1987.

TABLE II

Summary of Landfill Sampling Data

Parameter	Unit of Measure	SAMPLE NUMBER S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
Cyanide	g/g Dry	ND	0.76	0.72	1.97	2.28	ND	ND	ND	0.93	0.77	1.43	1.22
Barium	g/g Dry	76.0	110.0	204.0	228.0	120.0	133.0	244.0	153.0	113.0	45.0	ND	250.0
Zinc	g/g Dry	34.0	204.0	24.0	46.0	149.0	50.0	72.0	84.0	52.0	24.0	42.0	4.7
Halogenated Organic Scan (ECD)	ug/g Dry as Chlorine; Lindane Standard	ND	0.76	ND	0.10	0.10	ND	ND	ND	0.23	ND	ND	ND
PCBs	ug/g Dry as Aroclor 1242, ug/g Dry as Aroclor 1260, ug/g Dry Total	ND	0.17, 0.34, 0.41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = None Detected

Source: Final RCRA Facility Assessment Report, Municipal Dump Facility, Ponce, Puerto Rico, October 1987.

TABLE III

SUMMARY OF SURFACE IMPOUNDMENT AREA

	PARAMETER								
Sample No.	Cyanide	Chromium	Copper	Lead	Nickel	Silver	Zinc	Iron	Halogenated Organic Scan (ECD)
S-1	5.89	29.0	28.0	7.7	16.0	0.73	65.0	18,600.	<0.01
S-2	7.58	41.0	30.0	110.0	26.0	<0.4	84.0	64,400.	0.24
S-3	3.37	26.0	18.0	39.0	22.0	<0.4	77.0	15,700.	<0.01
S-4	2.47	30.0	23.0	19.0	21.0	<0.4	180.0	18,600.	0.07
S-5	4.62	31.0	18.0	1.8	22.0	<0.4	47.0	17,700.	0.09
S-6	6.64	30.0	30.0	1.7	36.0	>0.3	76.0	21,100.	0.13
S-7	0.78	29.0	29.0	1.8	24.0	<0.3	63.0	12,600.	0.02
S-8	0.81	40.0	40.0	25.0	34.0	<0.4	180.0	98,400.	0.11
S-9	1.22	55.0	55.0	8.3	20.0	<0.4	94.0	7,800.	1.40
S-10	0.48	19.0	19.0	1.2	5.1	<0.2	3.7	8,700.	ND
S-11	1.06	29.0	29.0	1.9	11.0	<0.2	36.0	8,900.	0.07
S-12	2.03	20.0	20.0	1.1	16.0	<0.3	14.0	10,000.	ND
S-13	3.47	18.0	18.0	0.77	4.1	<0.2	6.0	4,800.	0.17
S-14	3.66	28.0	28.0	2.6	20.0	<0.3	120.0	22,200.	0.15
S-15	8.44	35.0	35.0	7.5	24.0	1.5	59.0	19,200.	1.2
S-16	3.70	15.0	15.0	3.0	4.5	<0.2	7.0	8,900.	0.01

All Data Reported in ug/L.

Source: Final RCRA Facility Assessment Report, Municipal Dump Facility, Ponce, Puerto Rico, October 1987.

portion of the site where hazardous waste disposal has been documented, it was decided to concentrate sampling activities at that location. Four soil samples were collected and shipped to EPA contract laboratories for analysis. Data from this sampling are not yet available.

Ref. Nos. 1, 2, 14

2.3 GROUNDWATER ROUTE

The site is located in the south-central coastal zone where the climate is characterized as semiarid. The area experiences hotter temperatures and significantly less precipitation than most of Puerto Rico. Historically, the mean annual precipitation is 36 inches, although between 1972 and 1986, precipitation averaged only 30.3 inches per year. On a month-to-month basis, rainfall in the area varies greatly. This is mainly due to the hurricane season, which runs from June through October and may involve up to 40 inches of rain per event. Even so, little water is available for groundwater recharge as 91 percent of the rainfall in Ponce is reportedly lost to evapotranspiration.

Two geologic formations are recognized as being within the site boundaries. Generally, the Ponce Limestone Formation underlies the northern half of the site, while the older Juana Diaz Formation underlies the southern half. It appears as if, at one time, the entire Juana Diaz Formation was covered by the Ponce Limestone. Faulting and uplift caused the limestone to differentially erode in some areas, resulting in exposures of the Juana Diaz. The areas not affected by this movement are the northern half of the site and the southern hills which are capped by limestone beds. The lowest Ponce Limestone unit mapped at the site is a wedge-shaped member of homogenous light gray and brown hard calcareous silt. It is about 40 feet thick along the north-northwestern boundary, thins out to the east and south, and has an overall southward formation dip. This is overlain by orange to orange-brown extremely porous limestone, which is the most conspicuous type of rock found on site. It consists of abundant fossils, primarily mollusks and corals and crystalline limestone in a fine to medium sandy matrix. Nearly 200 feet of this unit is exposed on site, and has an overall permeability of 10^{-3} - 10^{-5} cm/sec.

The Juana Diaz Formation is described as consisting of two members. The upper portion is comprised of limestone and chalk with lenses of mudstone and gravel, and has a thickness of approximately 1023 feet. The lower member is predominantly mudstone and conglomerate, but this also contains lenses of limestone. The lower portion is approximately 1,386 feet thick, bringing the total thickness of the formation to 2409 feet. This portion of the Juana Diaz has a permeability of 10^{-3} to 10^{-5} cm/sec. However, the outcropping Juana Diaz beds consist of faulted and tilted layers of siltstone and mudstone which are unsaturated to a depth between 50 and 150 feet. This unsaturated zone

has a very low permeability, somewhere in the order of 10^{-7} cm/sec. Bedding dips in the Juana Diaz Formation vary, but are generally between 20 and 30 degrees to the south or southwest. The associated soils consist of silt, clay, and scattered zones of sand that are hard to very hard. Limestone seams and fragments occur throughout the formation and its soils.

Surface soils on site are comprised of two layers. The upper portion is a mixture of humus and organic material 1 to 3 feet thick. The lower layer is up to 10 feet thick and consists of both alluvium and caliche. During the site characterization study performed by Law Engineering, the surface soils were tested in the laboratory and found to have a permeability of 10^{-8} cm/sec. In addition to the naturally occurring soils found on site, several areas are covered with fill material. This material approaches a thickness of 54 feet, is very unstable, and reportedly emits methane gas.

On a regional scale, the Ponce Limestone, the Juana Diaz, and alluvial material are all sources of groundwater. But on site, only the Ponce Limestone and the Juana Diaz are water bearing. In the southwestern portion of the site, groundwater occurs in a greenish gray sandy clayey silt unit of the Juana Diaz Formation. The depth to groundwater varies in this formation, ranging from approximately 72 feet below the ground surface to as much as 150 feet below the ground surface. In the northeastern portion of the site, groundwater occurs in a light gray sandy clayey silt unit of the Ponce Limestone Formation. Here, groundwater occurs at approximately 130 feet below the ground surface in some areas and as deep as 260 feet below the surface in others. However, borings drilled on site indicated groundwater levels as high as 20 and 30 feet below the surface. Because of this, it is thought that either random pockets of perched water may exist throughout the landfill or that the surficial alluvial material, now buried by fill, contains water and is providing a conduit for recharge to the Ponce Formation.

Data obtained during and after the installation of the monitoring wells indicated the presence of several fault blocks within the Juana Diaz Formation. Two main west-northwesterly trending faults are acting as hydrologic barriers, separating groundwater in the Juana Diaz Formation south of the faults from groundwater in the Ponce Formation north of the faults. There is evidence of the existence of three separate groundwater flow systems on site, each having a boundary defined by one or both of these faults. In the southwestern portion of the site, recharge to the Juana Diaz groundwater system is thought to be along the main fault. Recharge to this system through the ground surface is nonexistent because of the highly impermeable unsaturated zone overlying the aquifer. Flow is then away from the fault, and because of the variations in tilt throughout the formation, moves in both a southwesterly and southeasterly direction. The Ponce Formation is recharged from northeast of the site, via the Rio Pastillo Basin, and may also experience minor local recharge from rainfall. Groundwater then flows southward, enters the site along the northern

boundary, and continues moving south towards the faults, by which it is eventually diverted to the southeast. The third groundwater route is thought to be within the fault block itself, where water is moving southeast along the major axis of the block.

The monitoring wells on site were sampled by Law Engineering for CECOS several times between August 1983 and March 1984. Analyses of the groundwater indicated the presence of chromium, nickel, barium, copper, lead, zinc, benzenehexachloride, dichloroethylene, dieldrin, and endosulfan. These contaminants were detected even though the groundwater monitoring wells are located around the proposed hazardous waste system and not the existing landfill. The aquifer tapped by these wells is the Juana Diaz, but it is the Ponce Limestone Formation that underlies the four hazardous waste sources known to exist on site. This indicates that either (1) another unidentified hazardous waste source existed in the southern half of the site property, (2) the hydrologic barriers created by the faults are permeable or (3) the contamination was caused by an off-site source.

The data collected during the Law Engineering study give no indication of the water quality of the Ponce Formation. During the NUS FIT 2 inspection, it was determined that there are no wells in the Ponce Formation that are also downgradient of the site. Consequently, no groundwater samples were collected. Further investigation, beyond the scope of a site inspection, would be necessary to accurately monitor both aquifers of concern.

According to a 1983 U.S. Geological Survey Report, there are at least six public supply wells within 3 miles of the site, the closest of which is only 1 mile away. However, since these wells are all located north of both the site and the aquifer's main point of recharge, and groundwater in the system is moving south, there is only a slight potential that they would be affected by contaminants on site. There are no wells in use downgradient of the facility because of the high salinity of the groundwater in the Juana Diaz Formation.

Ref. Nos. 1, 2, 7, 8, 9, 10, 11, 14

2.4 SURFACE WATER ROUTE

The Ponce Waste Disposal Site is located in an area characterized by rugged hills with elevations ranging from approximately 131 to 459 feet above mean sea level. These hills, known as the Upper Plains, were formed by the Juana Diaz and the Ponce Limestone Formations and exist both north and west of the City of Ponce. They separate Puerto Rico's Central Mountains to the north from the Coastal Plain area to the south.

The site property gradually slopes upward from east to west and is situated among two drainage basins. A major portion of the property is located in the drainage basin of the Rio Pastillo, which is located approximately 3,000 feet east of the facility. Topographic maps of the area show an unnamed intermittent stream that originates north of the site, flows through the site property, and bends east below the city of Jardines del Caribe, where it joins the Rio Pastillo. This stream was not observed during the NUS FIT 2 inspection. Background information indicates that it was cut off by landfilling activities, and that by 1970, there was no longer a stream on site. Even so, that portion of the stream bed south of the site property could still act as a drainage pathway for surface runoff, carrying contaminants into the Rio Pastillo. The second drainage basin in the area is that of the Quebrada del Agua. Approximately 10 percent of the site property, more specifically, the southwest corner, drains into this stream.

Both the Quebrada del Agua and the Rio Pastillo may be affected by contaminants migrating off site, but neither has the potential to affect the surrounding population. The Quebrada del Agua is intermittent, flowing only during periods of heavy rainfall and consequently, is not used for drinking or recreational purposes. A 1983 U.S. Geological Survey report describing public water supplies in Puerto Rico states that there are two surface water intakes in a branch of the Rio Pastillo. However, neither of these intakes would be affected by contaminants reaching the river as both are located approximately 3 miles upstream of the site. Available information gives no indication as to how many people are served by these intakes. Both the Quebrada del Agua and Rio Pastillo flow in a southeasterly direction. They eventually empty into the Caribbean Sea, which is located approximately 1 mile south of the site. Although there are no wetlands, critical habitats, or endangered species in the site area, the flora and fauna of all three surface waters may be damaged.

The conflicting accounts of waste disposal locations, the vast size of the property, and the time limitations of a site inspection made it difficult to address all the potential problems on site. Because of these circumstances, and the fact that no target population would be affected by the surface water route, no surface water samples were collected during the NUS FIT 2 site inspection.

Ref. Nos. 1, 2, 7, 9, 10, 11, 13, 14

2.5 AIR ROUTE

No readings above background were detected in the ambient air on the OVA or HNu prior to disturbance of the waste source, during the collection of soil samples, or from the monitoring wells on site. However, respirators were worn during sampling activities as the sample locations were

downwind of the asbestos disposal area. This area was roped off, covered, and clearly marked with signs stating that respirators should be worn while in the vicinity. There are no historic landmarks within view of the site.

2.6 ACTUAL HAZARDOUS CONDITIONS

The monitoring wells on site were sampled by Law Engineering for CECOS several times between August 1983 and March 1984. Analyses of the groundwater indicated the presence of chromium, nickel, barium, copper, lead, zinc, benzenehexachloride, dichloroethylene, dieldrin, and endosulfan. During this same period, CECOS collected soil samples on site which were found to contain low levels of cyanide, lead, zinc, barium, halogenated organics, and trace amounts of PCBs. These contaminants were detected even though the groundwater monitoring wells were drilled around the proposed hazardous waste system and not the existing landfill. In addition, from all the evidence accumulated during the Law Engineering field studies, there is a hydrologic barrier between the aquifer tapped by these wells and the aquifer that is underlying the four hazardous waste sources known to exist on site. The validity of these data is questionable, as the sampling and analyses did not take place under EPA supervision. However, if these contaminants are present in the groundwater, it is an indication that either (1) another hazardous waste source existed on site at one time (2) the hydrologic barrier is not impermeable, or (3) the contamination originated off site. Available information leads to the conclusion that, even though contaminants may be present in one or both aquifers underlying the site, there is only a slight potential for the surrounding population to be affected. But further investigation, beyond the scope of a normal site inspection, is necessary to accurately monitor the quality and flow of both aquifers of concerns.

In addition to groundwater contamination, surface water in the area could be affected by the facility's past disposal practices. It is possible that contaminants could have reached both the Quebrada del Agua and Rio Pastillo through either surface runoff or groundwater discharge. But, as with the groundwater route, such contamination would not affect drinking water supplies. There are no wetlands, critical habitats, or endangered species in the site area, but there is a potential that the flora and fauna of both rivers, and subsequently, that of the Caribbean Sea, may be damaged.

No other actual hazardous conditions pertaining to human or environmental contamination have been documented. Specifically:

- Contamination has not been documented either in organisms in a food chain leading to humans or in organisms directly consumed by humans.
- There have been no documented observed incidents of direct physical contact with hazardous substances at the facility involving a human being or a domestic animal.

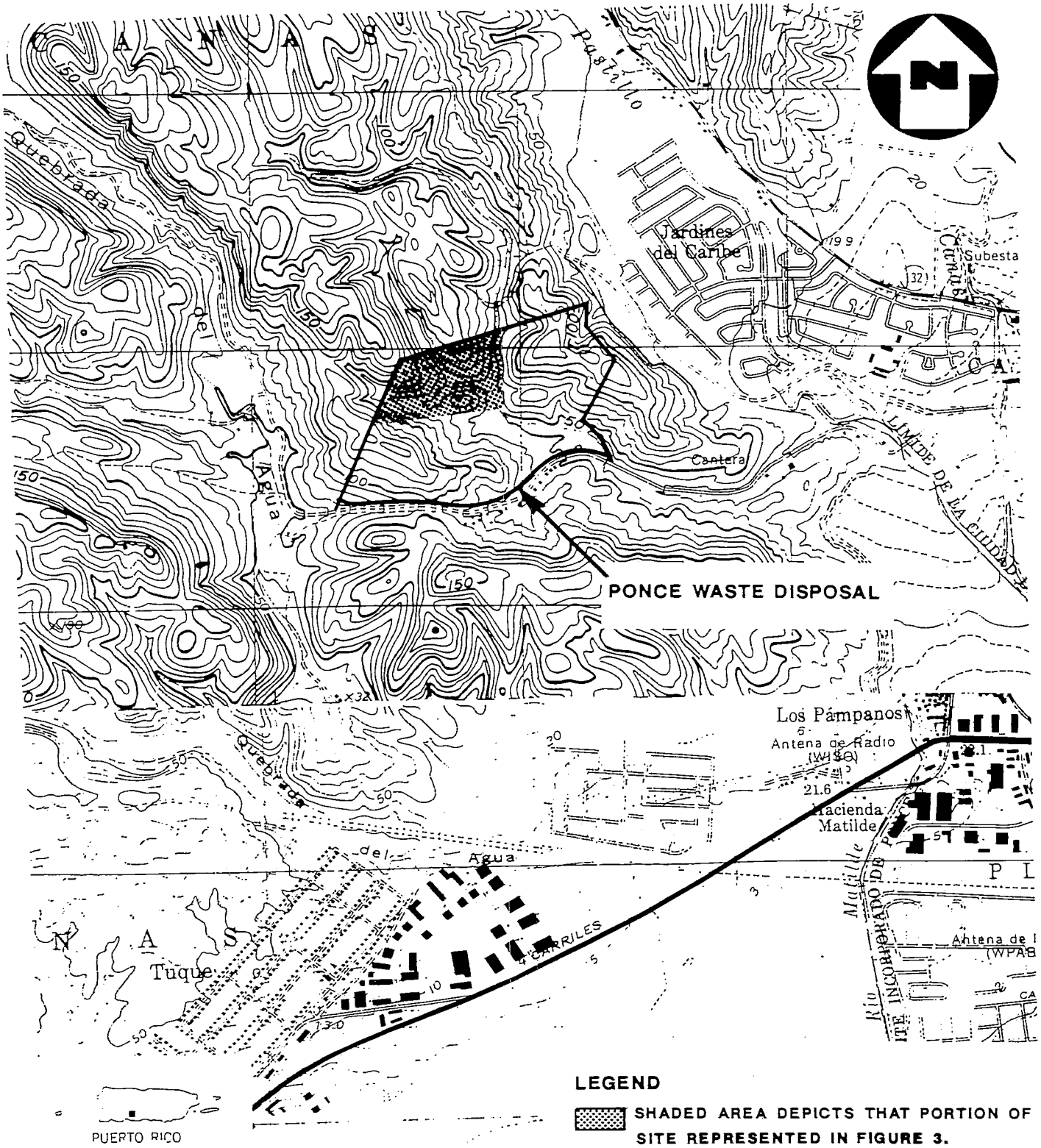
- There is no documented contamination of a sewer or storm drain that can be attributed to the hazardous material at the facility.
- There have been no documented incidents of fire or explosion on site.
- There have been no documented incidents of damage to flora or to fauna that can be attributed to the hazardous material at the facility.

Ref. Nos. 1 through 14

3.0 MAPS AND PHOTOS

PONCE WASTE DISPOSAL
MAGUEYES WARD,
PONCE, PUERTO RICO

Figure 1: Site Location Map
Figure 2: Site Map
Figure 3: Sample Location Map
Exhibit A: Photograph Log



LEGEND

SHADED AREA DEPICTS THAT PORTION OF SITE REPRESENTED IN FIGURE 3.

(QUAD) PUNUELES, P.R.

SITE LOCATION MAP
PONCE WASTE DISPOSAL
MAGUEYES WARD, PONCE, P.R.

SCALE: 1"= 2000'

FIGURE 1

NUS CORPORATION

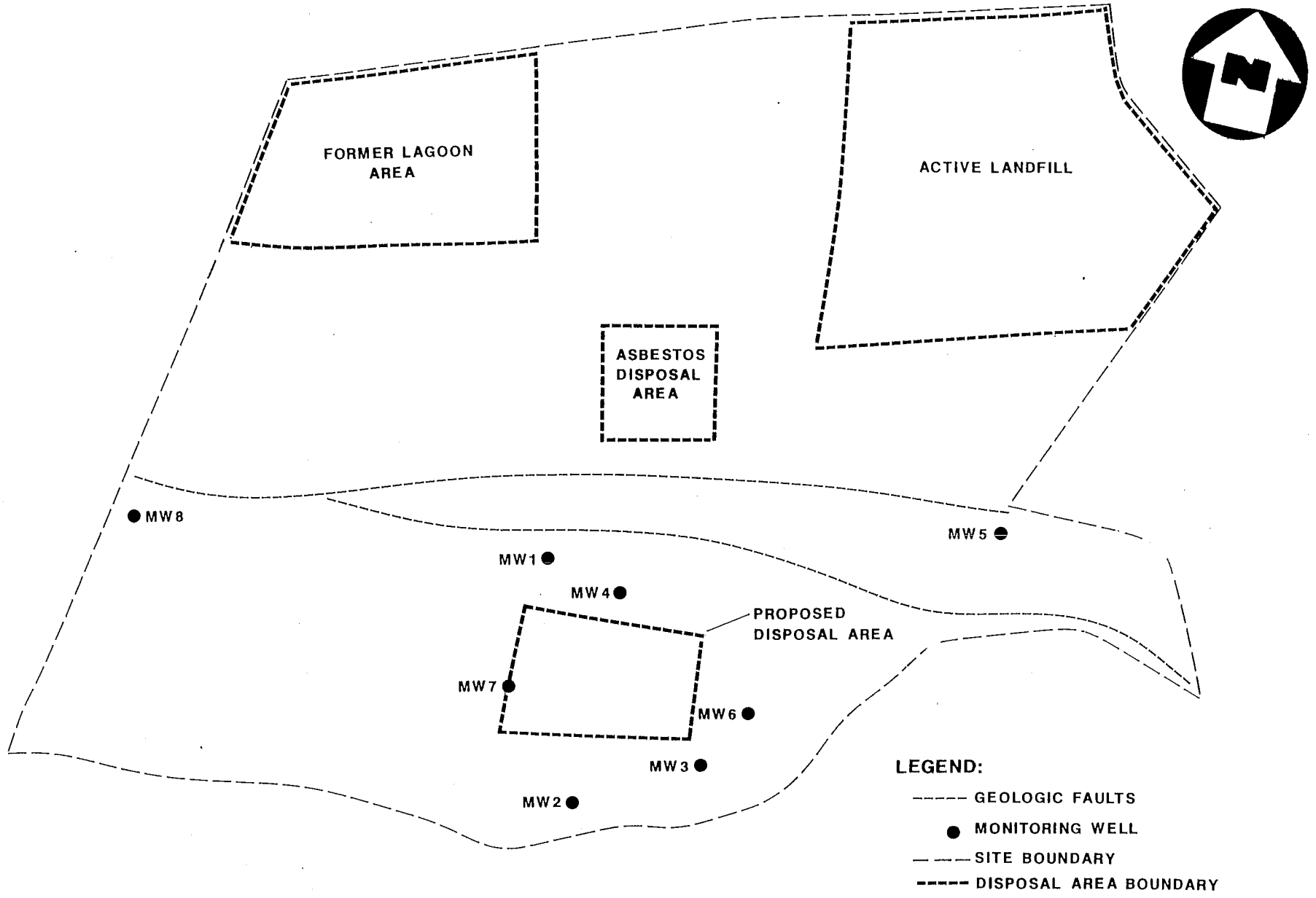


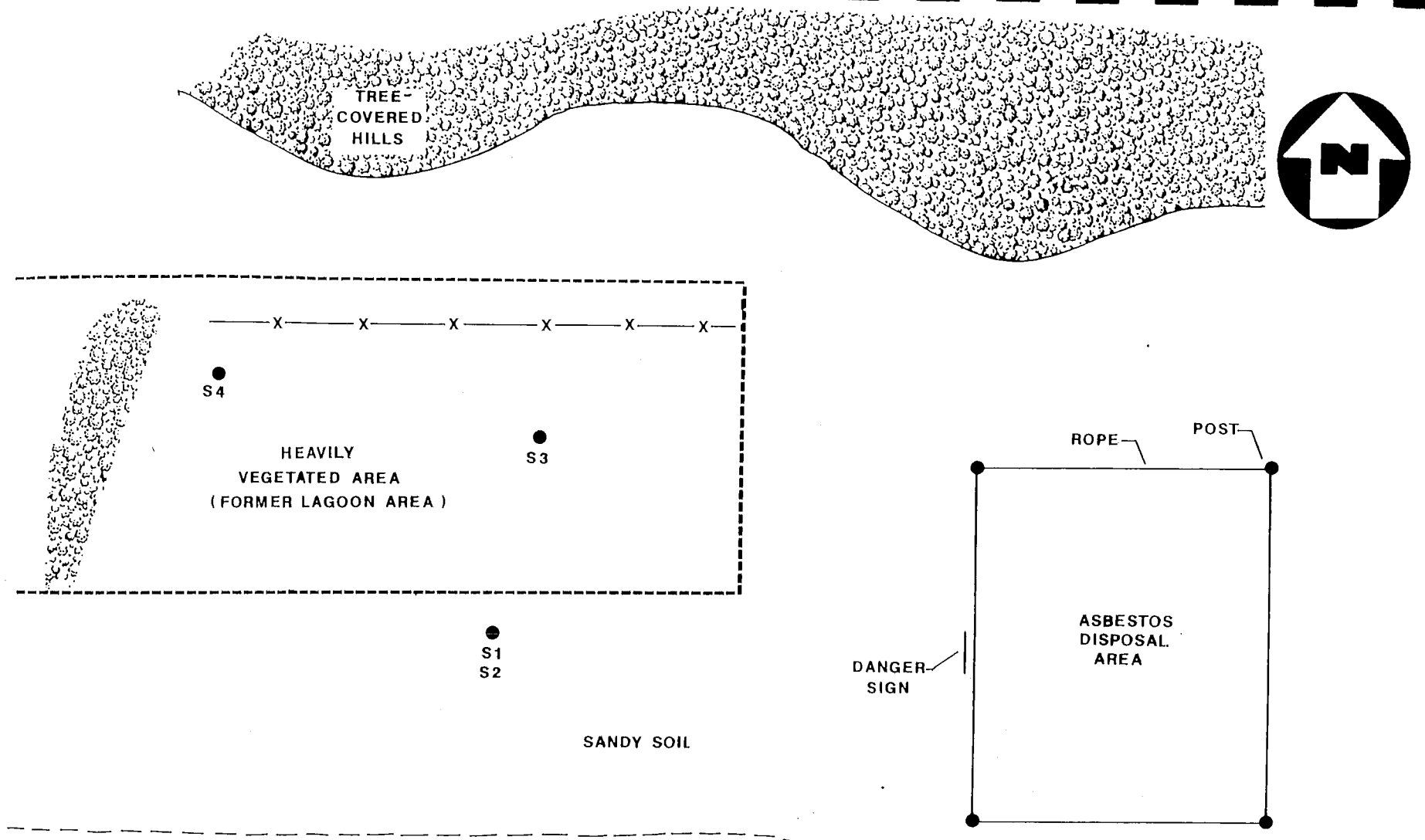
FIGURE 2

SITE MAP
PONCE WASTE DISPOSAL,
MAGUEYES WARD, PONCE, P.R.

(NOT TO SCALE)

NUS CORPORATION

02-8803-65-SI
Rev. No. 0



SAMPLE LOCATION MAP
PONCE WASTE DISPOSAL,
MAGUEYES WARD, PONCE, P.R.

(NOT TO SCALE)

FIGURE 3

NUS CORPORATION

Rev. No. 0

EXHIBIT A

PHOTOGRAPH LOG

PONCE WASTE DISPOSAL
MAGUEYES WARD, PONCE, PUERTO RICO

SITE RECONNAISSANCE: APRIL 7, 1988
SITE INSPECTION: APRIL 25, 1988

PONCE WASTE DISPOSAL
MAGUEYES WARD, PONCE, PUERTO RICO
TDD NO. 02-8803-65
APRIL 25, 1988

PHOTOGRAPH INDEX

Photo Number	Description	Time
1P-1	View of site entrance. A portion of the landfill can be seen in the background.*	1639
1P-2	J. Gutierrez and R. Lorfing conducting Level B reconnaissance.	0939
1P-3	Hypodermic needle on ground in former lagoon area.	0957
1P-4	R. Lorfing collecting soil sample PR11-S1.	1150
1P-5	R. Lorfing collecting soil sample PR11-S2.	1151
1P-6	R. Lorfing collecting soil sample PR11-S3.	1134
1P-7	R. Lorfing collecting soil sample PR11-S4.	1203
1P-8	View of former lagoon area showing dense vegetation and fence in background.	1211
1P-9	Distant view of former lagoon area. Dirt access road can be seen in the foreground.	1220
1P-10	View of asbestos disposal area.	1233

*Photo taken on April 7, 1988 during off-site reconnaissance.
All other photos taken on April 25, 1988 during site inspection.

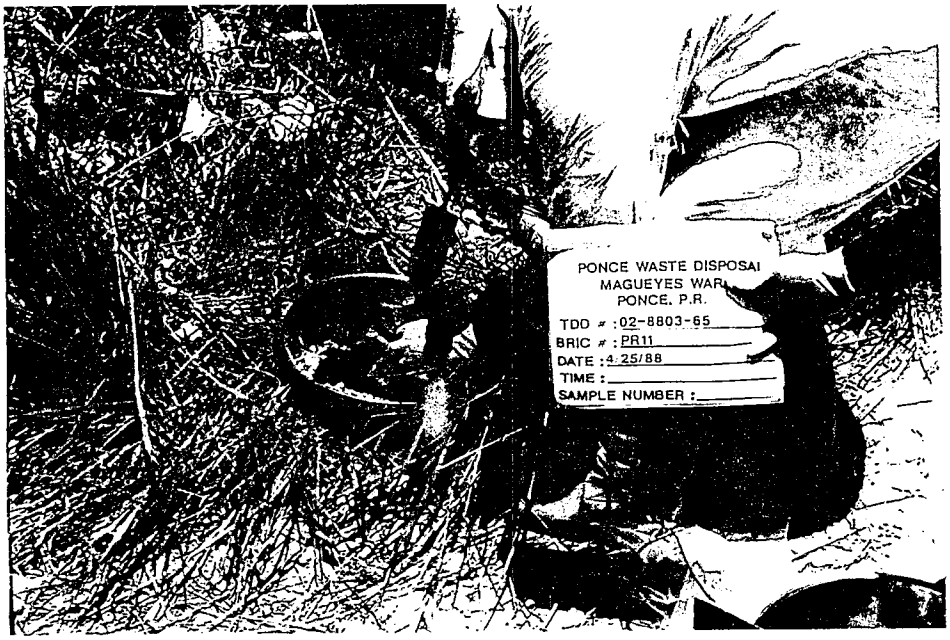
MAGUEYES WARD, PONCE, PUERTO RICO

1P-1 April 25, 1988 1639
View of site entrance. A portion of the landfill can be seen in the background.

1P-2 April 25, 1988 0939
J. Gutierrez and R. Lorfing conducting Level B reconnaissance.

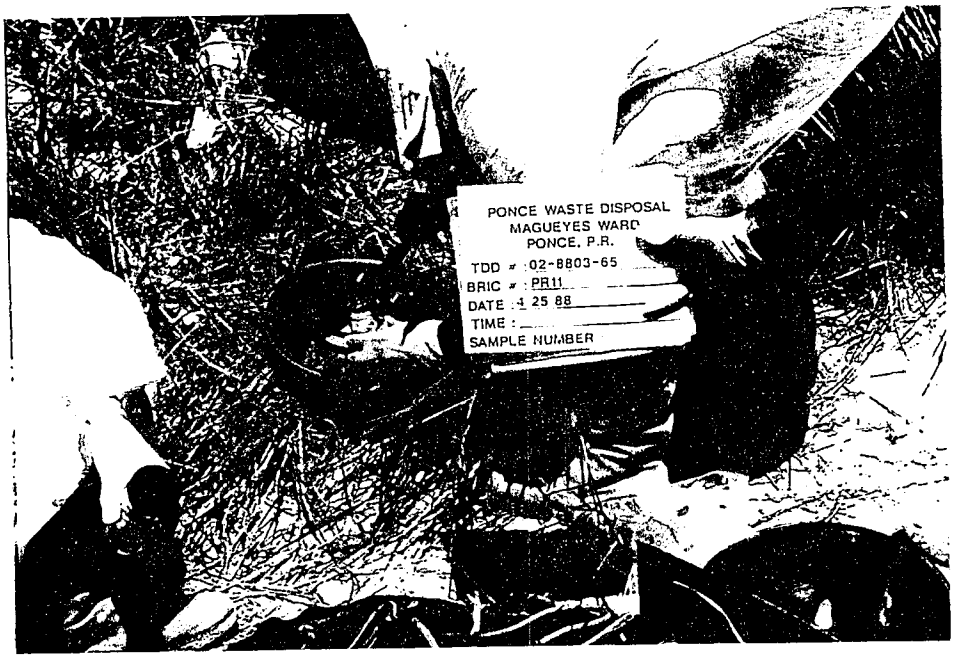
MAGUEYES WARD, PONCE, PUERTO RICO

1P-3 April 25, 1988 0957
Hypodermic needle on ground in former lagoon area.



1P-4 April 25, 1988 1150
R. Lorfing collecting soil sample PR11-S1.

MAGUEYES WARD, PONCE, PUERTO RICO



1P-5 April 25, 1988 1151
R. Lorfing collecting soil sample PR11-S2.

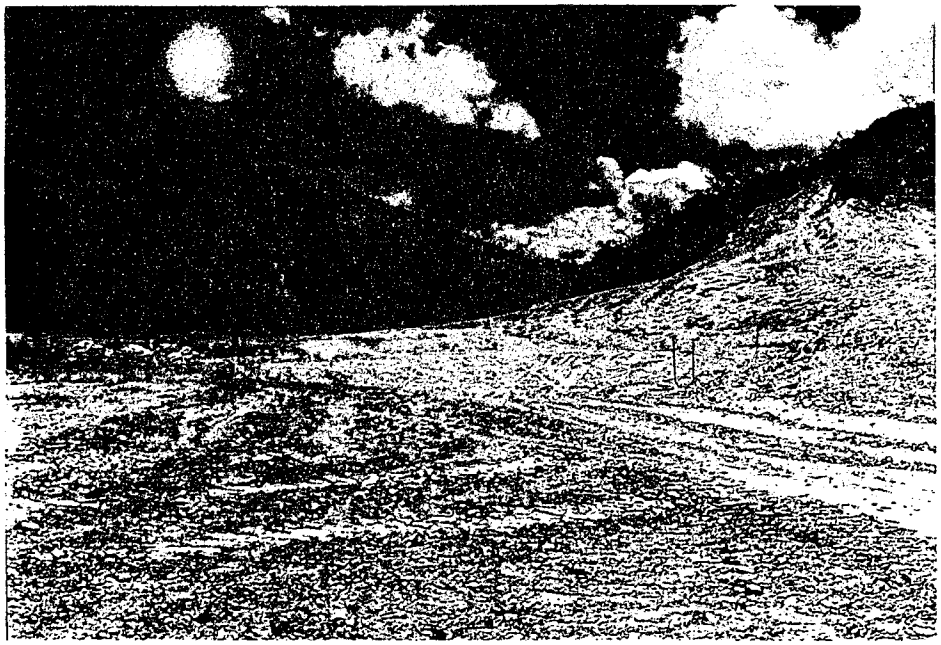
1P-6 April 25, 1988 1134
R. Loring collecting soil sample PR11-S3.

MAGUEYES WARD, PONCE, PUERTO RICO

1P-7 April 25, 1988 1203
R. Lorfing collecting soil sample PR11-S4.

1P-8 April 25, 1988 1211
View of former lagoon area showing dense vegetation and fence in background.

MAGUEYES WARD, PONCE, PUERTO RICO



1P-9 April 25, 1988 1220
Distant view of former lagoon area. Dirt access road can be seen in the foreground.

1P-10 April 25, 1988 1233
View of asbestos disposal area.

4.0 SITE INSPECTION SAMPLING RESULTS

To be provided upon receipt of analytical data.

5.0 CONCLUSIONS AND RECOMMENDATIONS

To be provided upon receipt of analytical data.

6.0 REFERENCES

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